

WHAT IS CLAIMED IS:

1. A method of monitoring at least one target substance in a biological system comprising:
  - a) providing said biological system comprising said at least one target substance;
  - b) labeling said at least one target substance with at least one apo metal binding protein;
  - c) providing conditions which permit said at least one apo metal binding protein to emit a signal;
  - d) observing or measuring the signal;
  - e) monitoring said at least one target substance based on the signal observed or measured.
2. The method of claim 1, wherein said step of monitoring comprises determining the location of said at least one target substance in said biological system.
3. The method of claim 1, wherein said step of monitoring comprises quantifying the amount of said at least one target substance in said biological system.
4. The method of claim 1, wherein said biological system is chosen from a virus, bacteria, plant, or animal.
5. The method of claim 1, wherein said at least one target substance is chosen from a cell or a tissue.
6. The method of claim 5, wherein said cell is chosen from a bacterial, fungal, plant or animal cell.
7. The method of claim 5, wherein said cell is labelled by transfecting said cell with a DNA molecule encoding said at least one apo metal binding protein.

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8. The method of claim 5, wherein said cell is labeled by linking said at least one apo metal binding protein to said cell.
9. The method of claim 5, wherein said at least one apo metal binding protein is provided to said cell *in vivo*.
10. The method of claim 5, wherein said at least one apo metal binding protein is provided to said cell *in vitro*.
11. A method of determining the cytotoxicity of a drug of interest comprising
  - a) exposing at least one cell to the drug of interest;
  - b) monitoring the at least one cell using the method of claim 5;
  - c) determine the cytotoxicity of the drug of interest by determining whether the at least one cell is influenced by the drug of interest.
12. The method of claim 5, wherein said at least one apo metal binding protein is linked to said tissue.
13. The method of claim 12, wherein said at least one target substance is a protein.
14. The method of claim 7, wherein said protein is labelled by preparing a fusion protein with said protein and at least one apo metal binding protein.
15. The method of claim 1, wherein said conditions which permit said at least one apo metal binding protein to emit a signal comprise providing at least one metal which binds to said at least one apo metal binding protein.
16. The method of claim 1, wherein said at least one apo metal binding protein is a copper binding protein.
17. The method of claim 15, wherein said copper binding protein is a blue copper protein chosen from azurin, pseudo-azurin, a plastocyanin, and a phytocyanin.

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- d) determining whether the therapeutic agent is effective treating the disease by monitoring the signal observed or measured from the cell.
29. A method of designing a therapeutic agent for treating a virus or bacterial infection comprising:
- a) labeling the virus or the bacteria with at least one apo metal binding protein;
  - b) providing conditions which permit said at least one apo metal binding protein to emit a signal;
  - c) observing or measuring the signal;
  - d) determining whether the therapeutic agent is effective treating the virus or bacterial infection by monitoring the signal observed or measured from the virus or the bacteria.
30. The method according to claim 29, wherein said virus is the HIV virus.
31. A eucaryotic cell comprising a DNA sequence encoding at least one copper binding protein.
32. The eucaryotic cell of claim 31, wherein said eucaryotic cell is an animal cell.
33. The eucaryotic cell of claim 31, wherein said DNA sequence comprises the azu gene.
34. The eucaryotic cell of claim 33, wherein said at least one blue copper protein is azurin.
35. A kit for monitoring at least one target substance in a biological system comprising at least one apo metal binding protein.